

by-side to form a 80-mm-high single magnetic core. The primary and secondary coils were wound identically to the core-coil assembly of Example 1. The secondary voltage versus primary current obtained is set forth below in Table II:

TABLE II

Primary Current (amp-turn)	Secondary Voltage (k V)
40	4.2
80	8.4
160	14.2
240	18.5
320	21.6
400	23.1

Secondary voltages exceeding 14 and 23 kV were attained with primary currents of about 160 and 400 amp-turns, respectively.

EXAMPLE 3

Five 15.6 mm high toroidal cores were prepared following the process of Example 1 and were assembled to form a single cylindrical core of about 80 mm in height. The core-coil assembly was substantially identical to that of Example 1, except that the secondary coil had 138 turns. The secondary voltage as a function of the primary current is set forth below in Table III:

TABLE III

Primary Current (amp-turn)	Secondary Voltage (k V)
40	5.4
80	10.2
160	17.8
240	22.4
320	25.6
360	26.1

Secondary voltages exceeding 10 and 26 kV were attained with primary currents of about 80 and 360 amp-turns, respectively.

EXAMPLE 4

An 80 mm high cylindrical core with the dimension given in Example 1 was prepared and heat-treated at 350° C. for 2 hours. After the heat-treatment, an air-gap was introduced along the cylinder axis by cutting-off part of the core. The primary and secondary coils were wound on the metallic section of the core. The rest of the core-coil assembly was substantially identical to that of Example 1. The resultant secondary voltage-versus-primary current is set forth below in Table IV:

TABLE IV

Primary Current (amp-turn)	Secondary Voltage (k V)
40	4.9
80	9.6
120	14.4
160	19.4
260	22.5
240	26.3
260	27.3

Secondary voltages exceeding 14 and 27 kV were obtained with primary currents of about 120 and 260 amp-turns, respectively.

Having thus described the invention in rather full detail, it will be understood that such detail need not be strictly adhered to but that further changes and modifications may suggest themselves to one skilled in the art, all falling within the scope of the invention as defined by the subjoined claims.

What is claimed is:

1. A magnetic core-coil assembly for generating an ignition event in a spark ignition internal combustion system having at least one combustion chamber, comprising a magnetic core that is iron based and further comprises metallic elements including nickel and cobalt, glass forming elements including boron and carbon, and semi-metallic elements, including silicon, said core being fabricated by heat treating an amorphous magnetic alloy and having a primary coil for low voltage excitation and a secondary coil for a high voltage output to be fed to a spark plug, said core-coil assembly having the capability of (i) generating a high voltage in the secondary coil within a short period of time following excitation thereof, and (ii) sensing spark ignition conditions in the combustion chamber to control the ignition event.

2. A magnetic core-coil assembly as recited in claim 1, wherein the magnetic core comprises segmented cores.

3. A magnetic core-coil assembly as recited in claim 1, wherein the output voltage in the secondary coil reaches more than 10 kV with a primary current of less than about 120 amp-turns and more than 20 kV with a primary current of 200 to 300 amp-turns within 25 to 100 μ sec.

4. A magnetic core-coil assembly as recited in claim 1, wherein the magnetic core is non-gapped.

5. A magnetic core-coil assembly as recited in claim 1, wherein the magnetic core is gapped.

6. A magnetic core-coil assembly as recited in claim 4, wherein the magnetic core is heat-treated at a temperature near the alloy's crystallization temperature and partially crystallized.

7. A magnetic core-coil assembly as recited in claim 5, wherein the magnetic core is heat-treated below the alloy's crystallization temperature and, upon completion of the heat treatment, remains substantially in an amorphous state.

* * * * *

8. A magnetic core-coil assembly for generating an ignition event in a spark-ignition internal combustion system having at least one combustion chamber, comprising a magnetic core having a primary coil for low voltage excitation and a secondary coil for a high voltage output to be fed to a spark plug, the core comprising amorphous metal, being non-gapped, and having a permeability ranging from about 100 to 300, said core-coil assembly having the capability of (i) generating a high voltage in the secondary coil within a short period of time following excitation thereof, and (ii) sensing spark ignition conditions in the combustion chamber to control the ignition event.
9. A magnetic core-coil assembly as recited in claim 8, said amorphous metal being iron-based.
10. A magnetic core-coil assembly as recited in claim 9, said amorphous metal further comprising boron and silicon.
11. A magnetic core-coil assembly as recited in claim 8, said permeability being achieved by heat-treatment of said amorphous metal.
12. A magnetic core-coil assembly as recited in claim 8, wherein the output voltage in the secondary coil reaches more than 10 kV with a primary current of less than about 120 amp-turns and more than 20 kV with a primary current of 200 to 300 amp-turns within 25 to 100 μ sec.
13. A magnetic core-coil assembly for generating an ignition event in a spark-ignition internal combustion system having at least one combustion chamber, comprising a magnetic core having a primary coil for low voltage excitation and a secondary coil for a high voltage output to be fed to a spark plug, the core comprising iron-based amorphous metal heat-treated to have a permeability ranging from about 100 to 300, said core-coil assembly having the capability of (i) generating a high voltage in the secondary coil within a short period of time following excitation thereof, and (ii) sensing spark ignition conditions in the combustion chamber to control the ignition event.
14. A magnetic core-coil assembly as recited in claim 13, said amorphous metal further comprising boron and silicon.
15. A magnetic core-coil assembly for generating an ignition event in a spark-ignition internal combustion system having at least one combustion chamber, comprising a magnetic core having a primary coil for low voltage excitation and a secondary coil for a high voltage output to be fed to a spark plug, the core comprising iron-based amorphous metal and being non-gapped, said core-coil assembly having the capability of (i) generating a high voltage in the secondary coil within a short period of time following excitation thereof, and (ii) sensing spark ignition conditions in the combustion chamber to control the ignition event.

16. A magnetic core-coil assembly as recited in claim 15, said amorphous metal further comprising boron and silicon.
17. A magnetic core-coil assembly for generating an ignition event in a spark-ignition internal combustion system having at least one combustion chamber, comprising a magnetic core having a primary coil for low voltage excitation and a secondary coil for a high voltage output to be fed to a spark plug, the core comprising iron-based amorphous metal and having a permeability ranging from about 100 to 300, said core-coil assembly having the capability of (i) generating a high voltage in the secondary coil within a short period of time following excitation thereof, and (ii) sensing spark ignition conditions in the combustion chamber to control the ignition event.
18. A magnetic core-coil assembly as recited in claim 17, said amorphous metal further comprising boron and silicon.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Hasegawa et al. Art Unit : Unknown
Serial No. : Not yet assigned Examiner : Unknown
Filed :
Title : MAGNETIC CORE-COIL ASSEMBLY FOR SPARK IGNITION SYSTEMS

Commissioner for Patents
Washington, D.C. 20231

STATUS OF CLAIMS AND SUPPORT FOR CLAIM CHANGES
37 C.F.R. §1.173(c)

This paper is being filed concurrently with the reissue application.

Claims 1-7 have not been changed. Claims 8-18 have been added. Claims 1-18 are pending in this reissue application.

New claim 8 is similar to claim 1, but does not recite that the magnetic core is iron-based, does not recite that the core includes certain metallic elements, glass forming elements or semi-metallic elements, and does not specify that the core is heat treated. Instead, claim 8 recites that the core comprises an amorphous metal, is non-gapped and has a permeability ranging from about 100 to 300. Support for these recitations can be found, for example, in col. 3, lines 13-26 of the patent specification. No new matter has been added.

Claims 9 to 11 depend on claim 8, and recite that the amorphous metal is iron based, includes boron and silicon, and that the permeability is achieved by heat treatment, respectively. Such limitations can be found in original claim 1 of the patent, for example. Claim 12 also depends on claim 8, and recites that the output in the secondary coil reaches more than 10kV with a primary current of less than about 120 amp-turns, and reaches more than 20kV with a primary current of 200 to 300 amp-turns within 25-100 μ sec. Support for claim 12 can be found,

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for example, in col. 3, line 66 to col. 4, line 16, and in col. 4, lines 35-64 of the patent specification. No new matter has been added.

New independent claim 13 is similar to claim 1, but also does not include the limitations discussed above with regard to claim 8. Rather, claim 13 recites that the amorphous metal core is heat treated to have a permeability ranging from about 100 to 300. Support for this recitation can be found, for example, in col. 3, lines 3-15 and lines 52-53 of the patent specification. No new matter has been added.

New claim 14 depends on claim 13, and recites that the amorphous metal includes boron and silicon. Support for this can be found, for example, in claim 1 of the patent. No new matter has been added.

New independent claim 15 is similar to claim 1, but does not include the limitations discussed above with regard to claim 8. Rather, claim 15 recites that the amorphous metal core is non-gapped. Support for this limitation can be found, for example, in col. 3, lines 13-20 of the patent specification. No new matter has been added.

New claim 16 depends on claim 15, and recites that the amorphous metal includes boron and silicon. This is supported, for example, in claim 1 of the patent. No new matter has been added.

New independent claim 17 is also similar to claim 1, but does not include the limitations discussed above with regard to claim 8. Claim 17 instead recites that the iron-based amorphous metal core has a permeability ranging from about 100 to 300. Support for this recitation can be found, for example, in col. 3, lines 3-15 of the patent specification. No new matter has been added.

New claim 18 depends on claim 17 and recites that the amorphous metal further includes boron and silicon. This is supported, for example, in claim 1 of the patent. No new matter has been added.

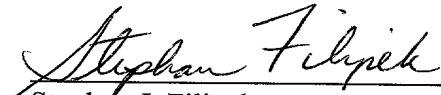
The applicant has provided the status of all the reissue patent application claims, and has endeavored to indicate the support in the disclosure of the patent for the new claims being added. If the Examiner has any questions, please call the undersigned attorney at the telephone number listed below.

Applicant : Hasegawa et al.
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REISSUE

Respectfully submitted,

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